



Defoliation Overview

Key issues for use of defoliants

- Ensure defoliation practices occur before the onset of frost.
- Aim to have soil moisture at refill points at defoliation. Severely water stressed crops will not allow defoliants to act effectively.
- If boll openers/conditioners are applied prior to boll maturation they may cause bolls to shed and reduce yield.
- The use of boll opener/conditioners should only be considered if the bolls that will be forced open are mature.
- Avoid application of defoliants when there is a risk of rainfall shortly after. Some defoliants are taken up slowly by the leaves and will wash off by rain, resulting in incomplete defoliation.
- To avoid regrowth issues it is prudent not to defoliate an area bigger than can confidently be harvested within two weeks.

DEFOLIATION – GET IT RIGHT FOR BETTER QUALITY AND BETTER RETURNS

An effective defoliation means cotton with less leaf and trash content, protects the integrity of fibre quality and keeps Australia's reputation for high quality, low contaminant cotton intact. A poor defoliation creates issues at harvest – and they don't stop there – these issues are passed on down the line and have negative effects for ginners, marketers and ultimately, our customers the mills and spinners. The Australian cotton industry has invested many resources to better understand the defoliation process and formulate guidelines for best practice.

Types of Harvest Aids

The categories of harvest-aid chemicals include herbicidal and hormonal defoliants, boll openers, and desiccants, each with a different mode of action.

Defoliants (Thidiazuron, Diuron, Dimethipin) All defoliants have a common mode of action to remove leaves. They increase the ethylene concentration in leaves by reducing the hormone auxin and/or enhancing ethylene production. Dimethipin alters the concentration of ethylene by reducing the amount of water in the leaf stimulating ethylene production. This change in ethylene concentration triggers separation in the abscission zone at the base of the petiole (leaf stalk). Chemical defoliant enters leaves through the stomates (minor route) or through the leaf cuticle (major route). Hormonal defoliants are applied to reduce auxin and/or enhance ethylene production, while herbicide defoliants injure or stress the plant into increasing ethylene production (similar to waterlogging or drought effects). If

herbicide defoliant is applied at too high rates the plant material may die before releasing enough ethylene to cause defoliation resulting instead in leaf desiccation (leaf death).

Boll openers/conditioners (Ethephon, Cycilanillide, Aminomethane Dihydrogen Tetrakisulfate) These chemicals specifically enhance ethylene production by providing a chemical precursor for the production of ethylene, which leads to quicker separation of boll walls (carpels).

Desiccants and herbicides (Sodium Chlorate, Magnesium Chlorate, Glyphosate, Diquat, Paraquat) Desiccants are contact chemicals that cause disruption of leaf membrane integrity, leading to rapid moisture loss, which produces a desiccated leaf. Desiccants should be avoided as they dry all plant parts (including stems) which can increase the trash content of harvested lint. Sometimes however, it is necessary to use desiccants if conditions do not enable the effective use of defoliant (eg very cold weather). Desiccants are also a reliable method to reduce leaf regrowth. High rates of some defoliant can act as desiccants.

Timing of the application for effectiveness

Defoliation induces leaf abscission allowing the leaf to fall off. Leaf removal is critical for reducing the amount of leaf trash in machine harvesters. Use of defoliant allows timely and efficient harvest of the lint to reduce quality losses from weathering and leaf stain from excess leaf trash. Boll opening is also accelerated by defoliation as removal of leaves exposes bolls to more direct sunlight, promoting increased temperatures for maturation, and drying and cracking of the boll walls. Application of defoliant earlier than 60 percent of bolls open will reduce micronaire and increase neps. In crops that have non-uniform maturity it is advisable that there be no more than 29 percent immature bolls (of total boll number) that are defined as immature bolls using the boll cutting technique to avoid increasing neps.

Monitoring maturity to avoid early crop cessation

To determine crop maturity monitor plants that are representative of the crop. Methods include:

- **Percentage bolls open** – Crops can be safely defoliated after 60- 65 percentage of the bolls are open. This method is simple and works well in crops with regular distribution of fruit.
- **NACB (Nodes above cracked boll)** – In most situations 4 NACB equates to the time when the crop has 60 percent bolls open. This is a useful methodology on crops that are uniform in growth, and is less time consuming than percentage open bolls.
- **Boll cutting** – The easiest and probably the most effective method to determine if bolls are mature or immature. It can be used effectively even when crops are not uniform (eg tipped out plant or gappy stands). Bolls are mature when: they become difficult to cut with a knife; the seed is well developed (not gelatinous)

and the seed coat has turned brown; and when the fibre is pulled from the boll it is stringy (moist but not watery).

Application issues

- Low humidity during application decreases uptake because chemicals dry rapidly on the leaf.
- For penetration of defoliants lower into the canopy consider using larger droplet size or directed sprays in the case of ground rig use. Use of spray adjuvants may decrease droplet sizes and this may work against chemical penetrating deeper into the canopy.
- Many growers use combinations of defoliants with different modes of action and multiple applications to enhance defoliation. Multiple applications are beneficial because leaves deep in the canopy can be covered fully.
- If increased waxiness of the leaves is suspected, applying the defoliant in warmer conditions can assist chemical penetration as the waxy layer is more pliable.

Resources

- [MyBMP](#)
- [Australian Cotton production Manual pages 120 -125](#)
- [Defoliation Timing, Fibre Quality and Textile Performance](#)
- [FIBREpak Chapter 11](#)
- Weather services
<http://www2.dpi.qld.gov.au/rainman/>, <http://www.bom.gov.au/climate/averages/>
- The [last effective flower tool](#) on the CottASSIST website which can be used to identify the timing of first frost for your locality
- Refer to the [Cotton Pest Management Guide](#) and manufacturers details for specific chemical defoliation options and rates